In the Claims

Please amend claims 1-4 as shown in the Amendment to the Claims section, infra. No new matter has been added.

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

AMENDMENT TO THE CLAIMS

1. (Currently Amended) A wrench comprising ~~a head suitable for co operating with a screw fastener,~~ means for measuring an[[~~the~~]] instantaneous applied torque, a head suitable for co-operating with a screw fastener, said head being fitted with means for measuring an[[~~the~~]] instantaneous angle of rotation, input means for recording characteristics of the screw fastener and a setpoint value for tightening thereof, and processor means for calculating an[[~~the~~]] instantaneous traction force on the screw fastener as a function of [[~~the~~]] measured instantaneous values of torque and angle and as a function of [[~~the~~]] stored characteristics of the screw fastener,

wherein the processor means further comprise software means for acting during a[[~~the~~]] tightening operation to detect automatically a[[~~the~~]] transition from an[[~~the~~]] elastic deformation range to a[[~~the~~]] plastic deformation range and to calculate the instantaneous traction force on the screw fastener as a function of ~~the result of detecting~~ the plastic deformation range.

2. (Currently Amended) A wrench according to claim 1, wherein the processor means calculate the instantaneous traction force in real time so as to enable the screw fastener to be tightened in a single stage.

3. (Currently Amended) A wrench according to claim 1, wherein the processor means further include software means for calculating an[[~~the~~]] instantaneous coefficient of friction of the screw fastener being tightened, the instantaneous coefficient of friction C(t) being calculated by solving the following integral:

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

$$(2)\quad C(t) = \int_{t'=0}^{t'=t}\left[f(t').\frac{D_t}{2} + \frac{d_2}{2}.\frac{K'\tan\alpha + f(t').\cos(\alpha)}{K' - f(t').\sin\alpha}\right]dF(t')$$

where:

$$\begin{cases} d_2 = d\ \frac{3}{8}.\sqrt{3.p} \\ \tan\alpha = \frac{p}{\pi.d_2} \\ K' = \frac{1}{\sqrt{1 + \tan^2\alpha + \tan^2\beta}} \end{cases}$$

and:

D_t: equivalent diameter of contact between a[[~~the~~]] washer and a[[~~the~~]] head of a[[~~the~~]] bolt;

d: thread diameter;

α: helix angle of a[[~~the~~]] ~~fastener~~ thread of the screw fastener;

d_2: theoretical diameter of contact between threads (on the flanks of the thread);

β: half-angle of the thread of the screw fastener (30° for ISO M thread).

4. (Currently Amended) A wrench according to claim 3, including means for detecting anomalies such as a[[~~the~~]] connection binding as a function of the ~~measured value for the~~ instantaneous coefficient of friction.

5. (Original) A wrench according to claim 1, wherein the means for measuring the instantaneous angle of rotation comprise a socket suitable for co-operating with the screw fastener, a bearing element made of a material having a low coefficient of friction, and a spring interposed between the socket and the

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

bearing element, the end of the bearing element for coming into contact with the screw fastener being provided with an element having a high coefficient of friction.

6. (Original) A wrench according to claim 1, wherein the processor means include software means for restarting tightening that has been interrupted prior to reaching the setpoint value.

7. (Original) A wrench according to claim 1, further ncluding storage means and a display device for storing and displaying information relating to tightening and available at the end of the tightening operation.

8. (Original) A wrench according to claim 7, wherein the information relating to tightening comprises in particular the torque C(t) and angle of rotation $\theta(t)$ values measured during tightening, the traction force F(t) calculated during tightening, the static and dynamic coefficients of friction (f_{static}, $f_{dynamic}$) calculated during tightening, and also the deformation range, with the corresponding plastic deformation information $(C, \theta, F)_{plastic}$ in the event of the screw fastener being subjected to plastic deformation.

9. (Original) A wrench according to claim 7, wherein the information relating to tightening includes how the calculated coefficient of friction varied as a function of speed and of time.

10. (Original) A wrench according to claim 7, wherein the information relating to tightening includes the calculated difference between the static and dynamic coefficients of friction.

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

11. (Original) A wrench according to claim 1, wherein the setpoint value corresponds to a predetermined traction force, and wherein the wrench includes warning means operated by the processor means once the calculated force reaches the setpoint value.

12. (Original) A wrench according to claim 1, wherein the setpoint value corresponds to a predetermined tightening torque, and wherein the wrench includes warning means operated by the processor means when the measured torque value reaches the setpoint value.

13. (Original) A wrench according to claim 1, wherein the setpoint value corresponds to a predetermined tightening angle, and wherein the wrench includes warning means operated by the processor means when the measured value for the angle of rotation reaches the setpoint value.

14. (Original) A wrench according to claim 1, wherein said wrench is a manual wrench, the means for measuring instantaneous applied torque, the input means, and the processor means being included in a handle to enable an operator to perform tightening manually.

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313